Docket No.: 0021.1997C

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of:

Yoshiki WATANABE

Application No.: 10/647,321 Group Art Unit: 3663

Confirmation No. 2029

Filed: August 26, 2003 Examiner: Diacou, Ari M.

For: OPTICAL AMPLIFICATION METHOD AND DEVICE USABLE WITH BANDS OTHER THAN THE C-BAND

APPEAL BRIEF UNDER 37 C.F.R § 41.37

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Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Sir:

In a Notice of Appeal filed August 23, 2007, the applicants appealed the Examiner's April 23, 2007 Office Action finally rejecting claims 35-39, 41, 42, 44 and 46-48. Appellants' Brief, together with the requisite fee set forth in 37 C.F.R. § 1.17, is submitted herewith. A Petition for a one-month extension of time, together with the requisite fee for same, is submitted herewith, thereby extending the period for response to November 23, 2007.

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I. REAL PARTY IN INTEREST (37 C.F.R. § 41.37(c)(1)(i))

The real party in interest is Fujitsu Limited, the assignee of the application.

II. RELATED APPEALS AND INTERFERENCES (37 C.F.R. § 41.37(c)(1)(ii))

Appellant, appellant's legal representative, and the assignee do not know of any prior or pending appeals, interferences or judicial proceedings which may be related to, directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

III. STATUS OF CLAIMS (37 C.F.R. § 41.37(c)(1)(iii))

Claims 35-39, 41, 42, 44 and 46-48 have been finally rejected and are on appeal.

IV. STATUS OF AMENDMENTS (37 C.F.R. § 41.37(c)(1)(iv))

Appellants' Amendment filed June 25, 2007 was entered for purposes of Appeal as indicated by the Advisory Action mailed July 11, 2007.

V. SUMMARY OF CLAIMED SUBJECT MATTER (37 C.F.R. § 41.37(c)(1)(v))

Independent claim 35 recites an optical amplifier (Fig. 6, for example) that includes a plurality of optical amplification mediums (for example, silica-based erbium-doped fibers 11, 12, and 13 in Fig. 6) for producing a gain, the gain having gain-characteristics of a wavelength band (Fig. 6; p. 18, ll. 1-7). The optical amplifier includes a gain controller (for example, AGC 50 in Fig. 6) constantly maintaining the gain for each optical amplification medium (Fig. 6; p. 20, ll. 13-19). The optical amplifier includes a gain-equalizer (for example, gain equalizers 21, 22, and 23 in Fig. 6) positioned after each optical amplification medium, and equalizing the gain-characteristic of a predetermined wavelength band of the optical amplification mediums (Fig. 6; p. 19, l. 19 – p. 20, l. 8). Each gain-equalizer equalizes each output light of the preceding optical amplifier medium and passes light with the predetermined wavelength band, the light of the predetermined wavelength band having flat optical power characteristics (p. 19, l. 19 – p. 20, l. 8; p. 35, ll. 16-19).

Independent claim 46 recites an optical amplifier (Fig. 6) that includes a plurality of optical amplification mediums (for example, silica-based erbium-doped fibers 11, 12, and 13 in Fig. 6) for producing a gain, the gain having gain-characteristics of a wavelength band (Fig. 6; p. 18, ll. 1-7). The optical amplifier includes a gain controller (for example, AGC 50 in Fig. 6) maintaining a constant population inversion ratio for each of the optical amplification mediums (Fig. 6; p. 20, ll. 13-19). The optical amplifier includes a gain-equalizer (for example, gain equalizers 21, 22, and 23 in Fig. 6) positioned after each optical amplification medium, and equalizing the gain-characteristic of a predetermined wavelength band of the optical amplification mediums (Fig. 6; p. 19, l. 19 – p. 20, l. 8). Each gain-equalizer equalizes each output light of the preceding optical amplifier medium and passes light with the predetermined wavelength band, the light of the predetermined wavelength band having flat optical power characteristics (p. 19, l. 19 – p. 20, l. 8; p. 35, ll. 16-19).

Independent claim 47 recites an optical amplifier (Fig. 6) that includes a plurality of optical amplification mediums (for example, silica-based erbium-doped fibers 11, 12, and 13 in Fig. 6) each producing a gain with a gain-characteristic of a wavelength band (Fig. 6; p. 18, ll. 1-7). The optical amplifier includes a gain controller (for example, AGC 50 in Fig. 6) controlling the gain-characteristic of the wavelength band of each of the optical amplification mediums with substantially equal gain-characteristics of the wavelength band (Fig. 6; p. 19, l. 19 – p. 20, l. 19).

The optical amplifier includes a plurality of gain-equalizers (for example, gain equalizers 21, 22, and 23 in Fig. 6) respectively positioned after each optical amplification medium equalizing each output light of the preceding optical amplification medium and outputting an output light having substantially flat power characteristics (p. 19, l. 19 – p. 20, l. 8; p. 35, ll. 16-19).

None of the claims contain an element expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof.

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL (37 C.F.R. § 41.37(c)(1)(vi))

Claims 35-39, 41, 42, 44 and 46-48 stand rejected under 35 U.S.C. § 102(b) as being unpatentable over U.S. Patent No. 5,995,274 ("Sugaya").

VII. ARGUMENT

A. Review of the prior art

1. U.S. Patent No. 5,995,274 ("Sugaya")

Sugaya teaches optical amplifying apparatuses which include a plurality of combinations of optical amplifiers and attenuators. See Figures 10, 27. The attenuation or light transmissivity of the optical attenuator 64 is varied so that the power of the wavelength-multiplexed optical signal is maintained at a constant power level corresponding to the number of channels in the wavelength-multiplexed optical signal. By maintaining the total optical output power at a constant level, the optical output is maintained at a constant level that matches the number of channels, and in response to a change in the number of channels, the optical attenuator 64 prevents a radical variation in the optical output power by having its attenuation frozen at a constant level.

B. Claims 35-39, 41, 42, 44 are patentable over U.S. Patent No. 5,995,274 ("Sugaya")

In the final Office Action, the Examiner rejected claims 35-39, 41, 42 and 44 over Sugaya.

It is submitted that the Examiner failed to establish a prima facie case of anticipation because the reference does not teach or suggest all the features of claim 35.

In order for a claimed invention to be anticipated under 35 U.S.C. § 102(b), all of the elements of the claim must be found in one reference. See Scripps Clinic & Research Found. v. Genentech Inc., 927 F.2d 1565, 1576, 18 USPQ2d 1001, 1010 (Fed. Cir. 1991). Further, "[a] claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros.v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir.1987).

Claim 35 recites "a gain-equalizer positioned after each optical amplification medium, and equalizing the gain-characteristic of a predetermined wavelength band of the optical amplification mediums, each gain-equalizer equalizing each output light of the preceding optical amplifier medium and passing light with the predetermined wavelength band, the light of the predetermined wavelength band having flat optical power characteristics." Sugaya does not teach or suggest this feature.

Sugaya discloses a plurality of combinations of optical amplifiers and attenuators, but

Sugaya does not provide for an optical gain equalizer to be placed after an amplification medium *such that light with flat optical power characteristics is passed in a predetermined wavelength band.* Sugaya provides that the power of the wavelength-multiplexed optical signal is maintained at a constant power level corresponding to a number of channels in the wavelength-multiplexed optical signal. Sugaya does not provide for optical gain equalizers which *flatten optical power* of output light of the preceding optical amplifier medium *in a particular wavelength band.*

In contrast, the gain equalizers (for example, gain equalizers 21, 22, and 23 in Fig. 6) of the invention of claim 35 have the gain equalization characteristics shown in Figure 4. The structure of the gain equalizer is such that there is a transmittance region in the band between 950 nm and 1000 nm so that 980 nm excitation light can pass through. In the 1490 nm to 1530 nm band, the transmittance falls as the wavelengths grow longer in order to produce the gain characteristics of the white cut out rectangle in Figure 3. In other words, there will be gain equalization such that there will be *flat gain characteristics* as shown by the white cutout rectangle area in Figure 3, and the *other wavelength bands are eliminated.* Figure 4 shows a structure that suppresses the gain peak centered at 1531 nm, which is the characteristic peak. Consequently, because the gain peak central wavelength will vary, the characteristics of the gain equalizer must be matched to the central wavelength of the gain for the selected amplification medium. See p. 11, l. 18 – p. 12, l. 11.

Sugaya, however, does not provide for gain-equalizers each positioned after an optical amplification medium to equalize the gain-characteristic of a predetermined wavelength band of the optical amplification mediums, such that each gain-equalizer passes light with the predetermined wavelength band.

Sugaya does not discuss or suggest all of the features recited in claim 35, so that claim 35 patentably distinguishes over Sugaya. Therefore, it is submitted that claim 35 is patentable over the prior art.

C. Claim 46 is patentable over U.S. Patent No. 5,995,274 ("Sugaya")

In the final Office Action, the Examiner rejected claim 46 over Sugaya.

The Examiner failed to establish a prima facie case of anticipation. The reference does not teach or suggest all the features of claim 46.

Claim 46 recites "a gain controller maintaining a constant population inversion ratio for each of the optical amplification mediums; and a gain-equalizer positioned after each optical

amplification medium, and equalizing the gain-characteristics of the wavelength band of the optical amplification medium, each gain-equalizer equalizing each output light of the preceding optical amplifier medium and passing light with a predetermined wavelength band, the light of the predetermined wavelength band having flat optical power characteristics." Sugaya does not teach or suggest these features.

As previously discussed, Sugaya does not provide optical gain equalizers which *flatten optical power* of output light of the preceding optical amplifier medium *in a particular wavelength band.*

Also, Sugaya does not provide a gain controller that maintains a constant population inversion ratio for each of the optical amplification mediums.

In contrast, the gain equalizers (for example, gain equalizers 21, 22, and 23 in Fig. 6) of the invention of claim 35 have the gain equalization characteristics shown in Figure 4. The structure of the gain equalizer is such that there is a transmittance region in the band between 950 nm and 1000 nm so that 980 nm excitation light can pass through. In the 1490 nm to 1530 nm band, the transmittance falls as the wavelengths grow longer in order to produce the gain characteristics of the white cut out rectangle in Figure 3. In other words, there will be gain equalization such that there will be *flat gain characteristics* as shown by the white cutout rectangle area in Figure 3, and the *other wavelength bands are eliminated.* Figure 4 shows a structure that suppresses the gain peak centered at 1531 nm, which is the characteristic peak. Consequently, because the gain peak central wavelength will vary, the characteristics of the gain equalizer must be matched to the central wavelength of the gain for the selected amplification medium and for the *population inversion ratio* for each individual amplification medium, and the structure must be such that the amount of equalization is adjusted depending on the wavelength. See p. 11, l. 18 – p. 12, l. 11.

Sugaya does not discuss or suggest all of the features recited in claim 46, so that claim 46 patentably distinguishes over Sugaya. Therefore, it is submitted that claim 46 is patentable over the prior art.

D. Claims 47 and 48 are patentable over U.S. Patent No. 5,995,274 ("Sugaya")

In the final Office Action, the Examiner rejected claims 47 and 48 over Sugaya. As these claims stand or fall together, the Appellant's argument is focused solely on the rejection of claim 35.

The Examiner failed to establish a prima facie case of anticipation. The reference does

not teach or suggest all the features of claim 47.

Claim 47 recites "a gain controller controlling the gain-characteristic of the wavelength band of each of the optical amplification mediums with substantially equal gain-characteristics of the wavelength band; and a plurality of optical gain-equalizers respectively positioned after each optical amplification medium equalizing each output light of the preceding optical amplification medium and outputting an output light having substantially flat power characteristics." Sugaya does not teach or suggest these features.

As previously discussed, Sugaya does not provide optical gain equalizers which *flatten optical power* of output light of the preceding optical amplifier medium.

Also, Sugaya does not provide a gain controller that controls the gain-characteristic of *the wavelength band of each of the optical amplification mediums* with substantially equal gain-characteristics of the wavelength band.

In contrast, the gain equalizers (for example, gain equalizers 21, 22, and 23 in Fig. 6) of the invention of claim 35 have the gain equalization characteristics shown in Figure 4. The structure of the gain equalizer is such that there is a transmittance region in the band between 950 nm and 1000 nm so that 980 nm excitation light can pass through. In the 1490 nm to 1530 nm band, the transmittance falls as the wavelengths grow longer in order to produce the gain characteristics of the white cut out rectangle in Figure 3. In other words, there will be gain equalization such that there will be *flat gain characteristics* as shown by the white cutout rectangle area in Figure 3, and the *other wavelength bands are eliminated*. Figure 4 shows a structure that suppresses the gain peak centered at 1531 nm, which is the characteristic peak. Consequently, because the gain peak central wavelength will vary, the characteristics of the gain equalizer must be matched to the central wavelength of the gain for the selected amplification medium and for the population inversion ratio *for each individual amplification medium*, and the structure must be such that the amount of equalization is adjusted depending on the wavelength. See p. 11, l. 18 – p. 12, l. 11.

Sugaya does not discuss or suggest all of the features recited in claim 47, so that claim 47 patentably distinguishes over Sugaya. Therefore, it is submitted that claim 47 is patentable over the prior art.

E. CONCLUSION

In summary, Applicant submits that claims 35-39, 41, 42, 44 and 46-48 patentably distinguish over the prior art. Reversal of the Examiner's rejection is respectfully requested.

Respectfully submitted,

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Date: 11-19-07

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VIII. CLAIMS APPENDIX (37 C.F.R. § 41.37(c)(1)(viii))

What is claimed is

1-34. (Cancelled)

35. (Previously Presented) An optical amplifier comprising:

a plurality of optical amplification mediums for producing a gain, the gain having gain-characteristics of a wavelength band;

a gain controller constantly maintaining the gain for each optical amplification medium; and

a gain-equalizer positioned after each optical amplification medium, and equalizing the gain-characteristic of a predetermined wavelength band of the optical amplification mediums, each gain-equalizer equalizing each output light of the preceding optical amplifier medium and passing light with the predetermined wavelength band, the light of the predetermined wavelength band having flat optical power characteristics.

36. (Previously Presented) An optical amplifier according to claim 35, wherein the gain equalizers have nearly the same equalizing characteristics.

37. (Previously Presented) An optical amplifier according to claim 35, wherein the optical amplifier has nearly even gain characteristics.

38. (Previously Presented) An optical amplifier according to claim 35, wherein the optical amplification mediums are made of erbium doped fibers.

39. (Previously Presented) An optical amplifier according to claim 35, wherein the constant gain of the optical amplification mediums is associated with an inversion ratio of about 0.8 to about 1.0 within the amplification medium.

40. (Cancelled)

41. (Previously Presented) An optical amplifier according to claim 35, wherein the gain equalizer obtains equalized gain within a wavelength-band from about 1490 nm to about 1530 nm.

42. (Previously Presented) An optical amplifier according to claim 35, wherein each gain equalizer attenuates gain at a peak wavelength.

43. (Cancelled)

44. (Previously Presented) An optical amplifier according to claim 35, wherein each gain equalizer produces an output, and the output has a nearly even gain characteristic.

45. (Cancelled)

46. (Previously Presented) An optical amplifier, comprising:

a plurality of optical amplification mediums for producing a gain, the gain having gain-characteristics of a wavelength band;

a gain controller maintaining a constant population inversion ratio for each of the optical amplification mediums; and

a gain-equalizer positioned after each optical amplification medium, and equalizing the gain-characteristics of the wavelength band of the optical amplification medium, each gain-equalizer equalizing each output light of the preceding optical amplifier medium and passing light with a predetermined wavelength band, the light of the predetermined wavelength band having flat optical power characteristics.

47. (Previously Presented) An optical amplifier, comprising:

a plurality of optical amplification mediums, each producing a gain with a gain-characteristic of a wavelength band;

a gain controller controlling the gain-characteristic of the wavelength band of each of the optical amplification mediums with substantially equal gain-characteristics of the wavelength band; and

a plurality of optical gain-equalizers respectively positioned after each optical amplification medium equalizing each output light of the preceding optical amplification medium and outputting an output light having substantially flat power characteristics.

48. (Previously Presented) An optical amplifier according to claim 47, wherein each of the gain-equalizers pass light having flat power characteristics within the predetermined wavelength band and minimize gain outside of the predetermined wavelength band.

49. (Withdrawn) A method of optical amplification, comprising:

producing a plurality of gains with a plurality of optical amplification mediums, each gain having a gain-characteristic; and

equalizing each output light of a preceding optical amplification medium and outputting a subsequent output light, of a predetermined wavelength band, having substantially flat power characteristics.

IX. EVIDENCE APPENDIX (37 C.F.R. § 41.37(c)(1)(ix))

Not applicable

X. RELATED PROCEEDING APPENDIX (37 C.F.R. § 41.37(c)(1)(x))

Not applicable